

Remarks

Claims 2-16 and 19-22 are pending herein. Claims 2, 3, 13 and 14 have been withdrawn as being directed to a non-elected invention. By this Amendment, claims 1, 17 and 18 have been canceled, claims 5-7, 9-12, 15 and 19 have been amended, and new claims 21 and 22 have been added.

Claims 5-7 and 9-11 have been amended so as to depend solely upon claim 4.

Claims 12 and 15 have been amended in part to recite that the activating unit is a heating unit. Support for this recitation can be found, e.g., in canceled claim 17.

Claims 12 and 15 have been further amended in part to recite that the nitrogen-including-gas supplying unit supplies the nitrogen-including gas directly into the reaction chamber. Support for this recitation can be found, e.g., in Fig. 1, wherein nitrogen-gas-introducing tube 15 is shown to directly lead into the reaction tube 2.

Claim 15 has also been amended to recite that the cleaning-gas supplying unit supplies the cleaning gas directly into the reaction chamber. Support for this recitation can be found, e.g., in Fig. 1, wherein cleaning-gas-supplying tube 14 is shown to directly lead into the reaction tube 2.

Claim 19 has been amended to be consistent to the changes made to claims 12 and 15.

New claim 21 depends upon claim 4 and recites that the cleaning gas comprises fluorine gas. Support for this recitation can be found in the instant specification at, e.g., page 19, lines 12-13.

New claim 22 depends upon claim 4 and recites that the thin film is a silicon nitride film. Support for this recitation can be found in claim 10 and in the specification at, e.g., page 19, line 5.

In the Office Action, claims 1, 5, 7-9 and 11 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,468,903 to Bolscher et al. ("Bolscher"); claims 12, 15, 18 and 20 are rejected under §102(b) as being anticipated by U.S. Patent No. 6,121,161 to Rossman et al. ("Rossman"); claims 12, 15 and 16 are rejected under §102(b) as being anticipated by U.S. Patent No. 5,900,161 to Doi; claims 4, 5, 7, 9 and 11 are rejected under §103(a) as being

unpatentable over Bolscher in view of U.S. Patent No. 6,095,158 to Shugrue; claim 6 is rejected under §103(a) as being unpatentable over Bolscher as applied to claim 1 and over Bolscher in view of Shugrue as applied to claim 4; claim 10 is rejected under §103(a) as being unpatentable over Bolscher as applied to claim 1 and over Bolscher in view of Shugrue as applied to claim 4; and claims 17 and 19 are rejected under §103(a) as being unpatentable over Rossman as applied to claims 12 and 15 above and further in view of U.S. Patent No. 6,444,037 to Frankel et al. ("Frankel").

In view of the amendments and remarks herein, Applicants respectfully request reconsideration and withdrawal of the rejections set forth in the Office Action.

I. Rejection of Claims 1, 5, 7-9 and 11

Claims 1, 5, 7-9 and 11 are rejected under §102(b) as being anticipated by Bolscher.

By this Amendment, claim 1 has been canceled, and claims 5-7 and 9-11 have been amended so as to depend solely upon claim 4. Therefore, this rejection is moot.

II. Rejection of Claims 12, 15, 18 and 20

Claims 12, 15, 18 and 20 are rejected under §102(b) as being anticipated by Rossman.

Claims 12 and 15 have been amended in part to recite that the activating unit is a heating unit, and further amended to recite that the nitrogen-including-gas supplying unit supplies the nitrogen-including gas directly into the reaction chamber. Claim 18 has been canceled. Claim 20 depends on claim 12 or claim 15.

Rossman does not teach or suggest that the activating unit is a heating unit. In addition, Rossman does not teach or suggest that the apparatus therein contains a nitrogen-including-gas supplying unit that supplies a nitrogen-containing gas directly into the reaction chamber.

Rossman teaches at col. 4, lines 5-8, that:

Deposition gases and liquids are supplied from gas sources 28 through lines 27, having control valves (not shown), into a gas mixing chamber 29 where they are combined and sent to gas supply ring manifold 16.

Thus, Rossman does not teach that the gas supplying tubes introduce a gas directly into the reaction chamber. Rather, the gases are first combined in a gas mixing chamber and sent to a manifold for delivery into the reaction chamber.

Thus, for at least the foregoing reasons, Applicants submit that Rossman does not anticipate claims 12, 15 and 20.

III. Rejection of Claims 12, 15 and 16

Claims 12, 15 and 16 are rejected under §102(b) as being anticipated by Doi. Claim 16 has been canceled.

As noted above, claims 12 and 15 have been amended in part to recite that the activating unit is a heating unit. Doi does not teach or suggest that the activating unit therein is a heating unit.

Thus, for at least this reason, Applicants submit that Doi does not anticipate claims 12 and 15.

IV. Rejection of Claims 4, 5, 7, 9 and 11

Claims 4, 5, 7, 9 and 11 are rejected under §103(a) as being unpatentable over Bolscher in view of Shugrue.

As noted above, claims 5, 7, 9 and 11 have been amended so as to depend solely upon claim 4.

Applicants respectfully submit that claims 4, 5, 7, 9 and 11 would not have been obvious over Bolscher in view of Shugrue.

Claim 4 recites the use of a fluorine-containing gas as the cleaning gas. The Office Action acknowledges that Bolscher does not teach the use of a fluorine-containing gas as the cleaning gas. Rather, Bolscher teaches the use of aqueous HF to remove deposits. Shugrue is cited for disclosing a method for cleaning a processing chamber using a fluorine-containing compound such as HF in its gaseous form.

Applicants submit that it would not have been obvious in view of Shugrue to use an HF gas in place of the aqueous HF in Bolscher. Shugrue teaches the use of HF gas to remove glass deposits, such as silicon dioxide and borophosphosilicate. Nothing in Shugrue or Bolscher suggests, to those of ordinary skill in the art, that Shugrue's gas can be used to remove deposits

of silicon nitride, silicon oxynitride or polycrystalline silicon films. On the other hand, Bolscher does not teach or suggest that aqueous HF can be used to remove glass deposits. Hence, neither disclosure suggests to those of ordinary skill, that the Bolscher's aqueous HF and Shugrue's gaseous HF are interchangeable for the particular applications in each of Bolscher and Shugrue.

Therefore, for at least this reason, Applicants submit that claims 4, 5, 7, 9 and 11 would not have been obvious over Bolscher in view of Shugrue.

Applicants submit that new claims 21 and 22 are also patentable over Bolscher in view of Shugrue.

Claims 21 and 22 both depend upon claim 4 and, therefore, are patentable over Bolscher in view of Shugrue for at least the same reason claim 4 is patentable over these references.

In addition, claim 21 recites that the cleaning gas comprises fluorine (F₂) gas. Neither Bolscher nor Shugrue teaches the use of fluorine gas for any purpose.

Thus, Applicants submit that new claims 21 and 22 would not have been obvious over Bolscher in view of Shugrue.

V. Rejection of Claim 6

Claim 6 is rejected under §103(a) as being unpatentable over Bolscher as applied to claim 1 and over Bolscher in view of Shugrue as applied to claim 4.

Claim 6 has been amended to depend solely upon claim 4. Applicants respectfully submit that claim 6 is patentable over Bolscher for at least the same reason claim 4 is patentable over this reference, i.e., Bolscher does not teach a fluorine-containing gas as the cleaning gas therein.

VI. Rejection of Claim 10

Claim 10 is rejected under §103(a) as being unpatentable over Bolscher as applied to claim 1 and over Bolscher in view of Shugrue as applied to claim 4.

Claim 10 has been amended to depend solely upon claim 4. Applicants respectfully submit that claim 10 is patentable over Bolscher for at least the same reason claim 4 is patentable over this reference, i.e., Bolscher does not teach a fluorine-containing gas as the cleaning gas therein.

VII. Rejection of Claims 17 and 19

Claims 17 and 19 are rejected under §103(a) as being unpatentable over Rossman as applied to claims 12 and 15 above and further in view of Frankel.

Rossman teaches that the activating unit therein is a plasma-generating unit. Rossman does not teach that the activating unit may be a heating unit. Frankel is cited in the Office Action for teaching the use of a heater as the activating unit therein.

Claim 17 has been canceled and its contents incorporated into claims 12 and 15. Thus, claims 12 and 15 both recite that the activating unit therein is a heating unit. In addition, claims 12 and 15 have been further amended to recite that the nitrogen-including-gas supplying unit supplies the nitrogen-including gas directly into the reaction chamber.

As noted previously herein, Rossman does not teach or suggest that the apparatus therein contains a nitrogen-including-gas supplying unit that supplies a nitrogen-containing gas directly into the reaction chamber. Frankel does not cure this deficiency. Frankel teaches at col. 13, lines 26-29 that:

Reactive and carrier gases are supplied through supply line 43 into a gas mixing box (or gas mixing block) 273 (FIG. 5), where they are preferably mixed together and delivered to plate 20.

Thus, Frankel also does not teach or suggest a nitrogen-including gas supplying unit that supplies a nitrogen-containing gas directly into the reaction chamber.

Therefore, Applicants respectfully submit that claims 12, 15 and 19 would not have been obvious over Rossman in view of Frankel.

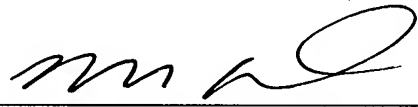
VIII. Conclusion

In view of the amendments and remarks herein, Applicants respectfully request that the rejections set forth in the Office Action be withdrawn and that claims 4-12, 15, 16 and 19-22 be allowed.

If any additional fees under 37 C. F. R. §§ 1.16 or 1.17 are due in connection with this filing, please charge the fees to Deposit Account No. 02-4300, Order No. 033082M274.

Respectfully submitted,
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Enclosures: (1) Petition for Extension of Time
(2) Check for the sum of \$120